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COMMISIONER

[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

Disclosed is an apparatus for testing performance of a mobile communication station having a global positioning system function, including a radio frequency (RF)/intermediate frequency (IF) block for converting GPS (Global Positioning System) RF signal and the CDMA RFsignal to intermediate frequency/baseband signals, a keypad/display for inputting a user test command from a user thereon and displaying a test result respectively, a GPS search block for searching GPS, and a mobile station modem(MSM) equipped with a test software for estimating the test result by performing test program with receiving the test mobile station(MSUT) status information from the GPS search block in accordance with the test command from the user through a user interface and a test mobile station(MSUT) incorporating the MSM.

[TYPICAL DRAWING]

FIG. 2

[INDEX WORDS]

gpsOne, MUSFET, GPS TEST UI, Data acquisition assist, Sensitivity assist

[SPECIFICATION]

[TITLE OF THE INVENTION]

APPARATUS AND METHOD FOR TESTING PERFORMANCE OF MOBILE STATION HAVING GPS FUNCTION

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 is a view diagram illustrating the construction of a conventional test apparatus of a performance of a mobile station having the GPS mounted thereon;

FIG. 2 is a view diagram illustrating the construction of a performance test apparatus of a mobile station having the GPS mounted thereon;

FIG. 3 is a view diagram illustrating the construction of a UI for driving a MSUT according to a preferred embodiment of the present invention;

FIG. 4 is a flowchart illustrating a performance test method of a mobile station having the GPS function according to a preferred embodiment of the present invention; and,

FIG. 5 is a view diagram illustrating the construction of reference parameters according to the operation of the MSUT and UI according to a preferred embodiment of the present invention.

Reference numerals of the essential parts in the drawings

21: test mobile station(MSUT)	22: mobile station modem(MSM)
23: keypad/display	24: RF/IF block
25: test user interface	26: test software
27: GPS search block	28: UART
29: diagnostic monitoring device	

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]

The present invention relates to an apparatus and method for testing performance of a mobile communication station having a global positioning system function for shortening the time for the testing performance of the mobile communication.

Currently, there has been a great growth in the development and application fields of the information on communication related techniques using a mobile communication station, and one among the fields corresponds to the mobile station adopting the GPS that is a position information collection system using a satellite communication.

The "gpsOne" technology of Qualcomm Company is for tracking the position of a code division multiple access (CDMA) mobile station having the gpsOne function mounted thereon with a hybrid type where having a combination of functions of the GPS and a network based location termination technology, wherein the GPS that tracks the position of a GPS receiver on the ground by measuring the time required for a GPS satellite signal to reach the GPS receiver and the network based location determination technology that tracks the position of the mobile station by measuring the time required for a CDMA base station signal to reach the mobile station are combined.

According to this hybrid type of technology, a result of a GPS code phase lock is measured from a result of a CDMA code phase lock, and then transmitted to a position determination equipment (PDE). Thus, a resultant position of the corresponding mobile station, which is calculated by the PDE, is used to match a necessary application.

Hereinafter, a conventional performance test of the mobile station having the GPS function will be explained with reference to the accompanying drawings.

FIG. 1 is a view illustrating the construction of a conventional apparatus for

testing a mobile station having the GPS mounted thereon.

For a purpose of test at stages of development and mass production of a terminal having a mobile station modem (MSM) 3300/5100 series mounted thereon for supporting the gpsOne technology of Qualcomm Company is recommended the technical document CL93-V2244-1 (2002.3.14.) of Qualcomm Company.

The test proposal of the Qualcomm Company as described above corresponds generally to a test for estimating the GPS RF path performance. This hardware performance test may be performed with a relatively inexpensive and simple manner, and thus may be applied to a test of produced samples and mass production prior to an engineering sampling (E/S) stage.

Items of the proposed test do not refer to an end-product based performance such as a positional accuracy, stability of position confirming service, required time, etc., but refer to hardware level performance such as a GPS RF path gain line-up, a GPS RF path loss, a Doppler frequency shift, time calibration number, etc. They may be applied to the development and mass production test of the gpsOne CDMA mobile station adopting an MSM chip.

As shown in FIG. 1, the test equipment includes a mobile station under test (MSUT) 15, a PC with diagnostic monitor (DM) software 13, a single channel GPS signal generator (SG) 12, a CDMA base station test set 11, a power combiner 14 for combining a CDMA RF signal and a GPS RF signal and inputting a combined signal to the MSUT block 15, a frequency counter (or oscilloscope), an RF shield box, and cables for connecting the respective blocks.

In operation, the MSUT 15 measures a code phase of a first channel GPS signal inputted from the GPS signal generator (SG) 12 using a CDMA frame clock obtained from the CDMA base station test set 11.

At this time, the frame clock of the GPS signal generator 12 is synchronized with that of the CDMA base station test set 11.

Also, the first channel GPS signal inputted from the GPS signal generator 12 has a predetermined type to match the contents of data acquisition assist (AA) and sensitivity assist (SA) data messages transmitted with an IS801 protocol from the DM to the MSUT 15 through a car-kit. Using this, a mock experiment on the AA and SA process that operates in an actual commercial network is performed.

The result of measurement is transmitted to and received in the DM through of the UAT of the MSUT 15, and estimation of the result is performed through post-processing of the stored result file using a separate tool in the PC 13.

As described above, the conventional test apparatus and method of the mobile station having the GPS function can test the hardware performance of the gpsOne mobile station even without expensive position determination entity (PDE) equipment in a situation that any commercial network applying the gpsOne technology is not properly constructed within and outside the country.

Also, the construction of the test equipment can be constructed inexpensively, and in case that the MSUT performs the test without opening a traffic channel (i.e., an idle mode test), the instrument required for the test can be shared by two or more MSUTs, thereby further reducing the cost of construction.

[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]

However, the conventional apparatus and method for testing of the performance of the mobile station having the GPS has the following problems.

The conventional test method requires a long time for once performing the whole tests, and the complicated test equipment.

For example, 8 hours or more are required for the whole tests of 6 items per

target network. Also, in case for a mobile station with a tri-band mode (DCN: 900MHz, PCS:1.5GHz, GPS:1800MHz) mobile station, 16 hours are required for performing the whole tests of personal communication system (PCS) and digital cellular network (DCN).

For further example, if the number of tests is increased in order to secure the reliability, more than 100 hours will be required. Especially, in order to perform the test of the performance of the MSUT using a diagnostic monitoring device during the test of a mass production, about 7 minutes at maximum is required as the operation time of the MSUT in measuring the GPS code phase as many as 100 times after establishing a traffic channel with respect to only one item of a 'sensitivity without Sensitivity Assist'.

Accordingly, an object of the present invention is directed to an apparatus and method for testing a performance of a mobile station having a GPS function that substantially obviates one or more problems due to limitations and disadvantages of the related art.

Another object of the present invention is to provide an apparatus and method for testing a performance of a mobile station having a GPS function that can simplify the test equipment and reduce a test time.

Still another object of the present invention is to provide an apparatus and a method for testing a performance of a mobile station having a GPS function that may reduce a test time.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description

and claims hereof as well as the appended drawings.

[PREFERRED EMBODIMENTS OF THE INVENTION]

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, an apparatus for testing performance of a mobile communication station having a global positioning system (GPS) function includes a radio frequency (RF)/intermediate frequency (IF) block for converting GPS (Global Positioning System) RF (radio frequency) signal and the CDMA (Code Division Multiple Access) RF(radio frequency) signal to intermediate frequency/baseband signals, a keypad/display for inputting a user test command from a user thereon and displaying a test result respectively, a GPS (Global Positioning System) search block for searching GPS, a mobile station modem(MSM) equipped with a test software for estimating the test result by performing test program with receiving the test mobile station(MSUT) status information from the GPS search block in accordance with the test command from the user through a user interface and a test mobile station(MSUT) incorporating the MSM.

In another aspect of the present invention, a method for testing performance of a mobile communication station having a global positioning system function, includes the steps of setting set values according to a test type by an input through a keypad of the mobile station, if an idle mode is in an off state, entering a traffic state, if a currently proceeding test is for the first time, controlling a start of a global positioning system (GPS) operation, judging whether the present state is the first state that waits for the AA data after passing through the test management step, the second state where the setting by the user is With SA(use_sa = with SA) or the third state that waits for the test result, sending the acquisition assist (AA) data message and counting a number of tests in the first state, performing a pilot phase measurement (PPM) search operation and a global

positioning system (GPS) search operation using the AA data message and the SA data message in the second state, informing the success/fail of the test to a User Interface and repeatedly testing each test item of the performance by using the performed result in a predetermined number of the tests in the third state, and displaying the repeated test results.

It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

FIG. 2 is a view diagram illustrating the construction of a performance test apparatus of a mobile station having the GPS mounted thereon. FIG. 3 is a view diagram illustrating the construction of a User Interface for driving a MSUT according to a preferred embodiment of the present invention.

The present invention is provides for reducing the time required for the performance test of the mobile station having the GPS mounted thereon and is supported by the Qualcomm chip. According to a preferred embodiment of the present invention, test software for testing the performance of the MSUT 15 and a test user interface (UI) for the performance test are constructed within a mobile station under test (MSUT).

Specifically, according to a preferred embodiment of the present invention, the test proceeding of the MSUT is not instructed and monitored through by the diagnostic monitoring device (DM), but by the construction of the MSUT equipment required for

the test proceeding is simplified and the time required for the test is reduced by programming the corresponding test process including an internal software test block, thereby a test equipment required for the test proceeding is simplified and time required for the test is reduced by a proper keypad manipulation and UI manipulation through a car kit.

The test apparatus, as shown in FIG. 2, includes a GPS signal generator for outputting a first channel GPS RF signal, a CDMA base station test set for outputting a CDMA RF signal. Referring to Fig. 2, the MSUT 21 includes, a radio frequency (RF)/intermediate frequency (IF) block 24 for receiving the GPS RF signal and the CDMA RF signal, a keypad/display 23 for inputting a test command from the user thereon and displaying a test result respectively, the mobile station modem (MSM) 22, and a universal asynchronous receiver/transmitter (UART) via car kit 28.

The mobile station modem (MSM) 22 includes a GPS search block 27 for generating status information of the MSUT 15, a test user Interface 25 for receiving test software status from the test block software 26 and outputting a first test command for user, and a test block software 26 outputting and transferring the first test command from test software, Data Acquisition Assist (AA) data message, and Sensitivity Assist (SA) data message according to the MSUT status information of the MSUT 21 received from the GPS search block 27, to perform the testing program.

A test application of the diagnostic monitoring device (DM) software on PC may be removed, but may be used in case of need. The test command from the user through the diagnostic monitoring device 29, AA/SA messages, data logging on in response to the test result, etc., from the DM diagnostic monitoring device 29 are transmitted and/or received performed through the UART 28 in the MSUT 21.

The performance test of the MSUT having the test software is driven by

manipulation (e.g., manipulation by the user on the keypad or diagnostic monitoring device (DM)) of the dedicated user interface. The MSUT to performs the test according to the predetermined setting reference, and estimates the test result by the internal test software block 26 without transmitting the test result through the UART 28 to an external using internal test software 26, and to displays the estimation result through a display (e.g., an liquid crystal display (LCD) panel) of the MSUT 21.

At this time, the detailed operation and setting of the test user interface are as follows.

For the performance test through an air path, it is necessary to locate the MSUT inside the shield box, and at this time, the test software 26 is driven by either one of the two following methods.

The first method is to drive the test software 26 of the MSUT by manipulating the GPS test user interface by software by software through the diagnostic monitoring device (DM).

The second method is to drive the test software of the MSUT by giving the test command from the diagnostic monitoring device (DM) directly to the MSUT without passing through the GPS test user interface.

In the first method, the test software 26 may be driven without an additional work, but in the second method, a separate software countermeasure may be needed.

Also, the display of the test result may be displayed performed based on a measurement-monitoring message outputted to the diagnostic monitoring device (DM), not through the LCD display of the MSUT, and in this case, a separate software countermeasure may also be needed.

The mobile station test apparatus (MSUT) having a test software according the a preferred embodiment of the present invention as constructed above can be modified to

various combinations according to a test purpose and a test environment.

Necessary Function Items	Section Division and Constituent Elements and Section Classification and Procedures and/or Element required for each Section		
Test S/W Driving	DM	Test Software	Test UI
Keypad Manipulation		□,□,□,□	□,□,□,□,□
MSUT test UI Manipulation by DM	□,□	□,□,□,□	□,□,□
Trans. from DM to MSUT	□,□	□,□,□,□	Test UI
Test Result Display by means of DM	DM	Test Software	
Display of MSUT		□,□,□,□	□,□,□,□,□
Display Window of DM	□,□	□,□,□,□	

The test is performed by using at least two function items among the respective necessary function items may be summed in duplication, at this time, and composed of procedures and/or elements of the at least two necessary function items selected for the test constituent elements obtained are by OR-gating the constituent elements required for the respective necessary function items.

For example, in case that the test software is driven by the keypad manipulation and a the test result display means of the test result is the message a display window of the diagnostic monitoring device (DM) 29, on assumption that the two necessary function items are used, the test and the display of the test result are performed by the constituent elements with procedures and/or elements of □, □, □, □, □, □, □, □, □, □ in FIG. 2, through combination of all the procedures and/or elements constituent elements required for the respective necessary function items in Table 1.

As described above, in the present invention, the number of the procedures and/or elements required for testing performance of the MSUT may be composed of

combinations of the constituent elements of 15 at maximum to 6 at minimum.

Specifically, □ denotes the diagnostic monitoring device (DM), □ a test command from the DM 29, □ an AA/SA message from the DM 29, □ a test result data logging in response to the test result, □ a MSUT status information of a MSUT, □ a test command from the test software, □ an AA/SA data message from the test software, □ the test software, □ a test software status information from the test software, □ a test command from the user, □ a test user interface, □ a user interface input/output (I/O) port, and □ a keypad/display in the MSUT, respectively.

As shown in Table 1, in case of driving the test software by manipulation of the user on the keypad, the driving performance test of the MUST is performed by the constituent elements with the procedures and/or elements of □, □, □, □, □, □, □, □, □, and in case of driving the test software by manipulating the test user interface (UI) of the MSUT using the diagnostic monitoring device (DM), the driving is performed by the constituent elements with the procedures and/or elements of □, □, □, □, □, □, □, □, □.

A lso, in case of driving the test software by transmitting the test command from the diagnostic monitoring device (DM) to the MSUT, the performance test of the MUST is performed with the procedures and/or elements of by the constituent elements of □, □, □, □, □, □.

Also, in case of using the display means of the MSUT as the display means of the test result, the display of the test result is displayed with the procedures and/or elements of by the constituent elements of □, □, □, □, □, □, □, □, □. In case of using the message display window of the diagnostic monitoring device (DM), the display of the test result is displayed by the constituent elements with the procedures and/or elements of □, □, □, □, □, □.

Meanwhile, the construction and definition of the menus of the test UI are as follows.

Main Menu	Sub Menu	Menu Definition
1.Sensitivity		Sensitivity Test execution
2.Cn0/Dopp		C/N0 Calibration and Doppler Estimation test execution
3.Tcal		Time Calibration Test execution
4.Settings	1.Idle mode OFF/ON	Idle mode or traffic channel selection, default ; OFF
	2.SA/no SA, no SA/SA	With SA or without SA Designation, default ; no SA
	3.TEST NUM (Proceeding No. n)	Designation of number of Repetitions for each test default ; 10 times

The test user interface 25 for driving the test software on the MSUT according to a preferred embodiment of the present invention is located on a test mode menu list to which an access by a general user is intercepted from a general user.

First, as shown in FIG. 3, if a "Factory Test" menu displayed on the LCD display window of the MSUT is selected, the main menus of "1.Sensitivity", "2.CnO/Dopp", "3.Tcal", and "4.Settings" as shown in Table 2 are displayed in order.

In this state, if "4.Settings" is selected, the sub menus of "1.Idle Mode", "2.SA/no SA" and "3.TEST NUM" are displayed, while if "1.Sensitivity" is selected, the present mode of the MSUT is changed to a GPS continuous mode. In this operating mode, the MSUT to proceed the performance test, and updates the rate of success 's' (s = m/n * 100) is continuously, wherein updated as 'n' is the number n of proceedings of a performance test of the MSUT and 'm' is the number m of successes of the performance test are simultaneously counted.

If the test of one selected main menu is completed, the measured values of the selected main menu are finally displayed. Another main menu ("2.CnO/Dopp" or "3.Tcal") is selected, and the test is successively performed.

Herein, "CnO" means the GPS a ratio of a GPS RF signal power-to-and noise signal power ratio calculated in at the base band.

If the test is completed, the measured item values of test items as shown in Table 2 are finally displayed.

Among the measured item values in shown in Fig. 3, "CnO_avg" denotes the average of "CnO" values, and "CnO_std" denotes the standard deviation of the "CnO" values.

Also, "Dop_avg" denotes the average of the Doppler tests, and "Dop_std" denotes the standard deviation of the Doppler tests.

The construction test mode menu list of the user interface is described as one preferable embodiment, and it is possible to adopt any different menu construction list and a display method.

The operation of the performance test of the GPS mobile station according to a preferable embodiment of the present invention will be explained in detail.

FIG. 4 is a flowchart illustrating a performance test method of a mobile station having the GPS function according to a preferred embodiment of the present invention. FIG. 5 is a view diagram illustrating the construction of reference parameters according to the operation of the MSUT and UI according to a preferred embodiment of the present invention.

First, the MSUT performs an independent test (stand_alone test start) by a user's manipulation on a keypad the keypad input (step S401).

By the manipulation on the keypad input, the test mode and the number of tests is designated. For example, the test mode whether to proceed a test with SA is set to test mode designation, designation of whether to proceed the test with SA or without SA, and designation of the number of tests.

If the performance test of the MSUT having the GPS function (hereinafter, GPS mobile station) starts through the keypad according to an input on the keypad (gps_ntest_start) (step S402), the test enters into a traffic state (step S404) and if the idle mode is off in the test mode set after an origination call message is transmitted from the MSUT to a base station for establishing a communication path originating step for connecting to a network (cm_call_cmd_orig) (step S403))., the test mode of the MSUT is in a traffic state (S404).

If the performance test starts after entering into the traffic state (ntest_start_test) (step S405), it is judged whether the currently proceeding test is for the first time or not (step S406).

If it is judged that the test is for the first time, the start of the GPS operation is controlled (gps_sess_ctrl) (S407), and if not, the next step proceeds without the step of controlling the start of the GPS operation.

It is judged (sission_ntr → session_state) whether the present state is the first state that waits for the AA data after passing through the test management (ntest_manager) step (S408), the second state where the setting by the user is With SA (use_sa = with SA), or the third state that waits for the test result (S409).

In case of the first state waiting for the AA data, the acquisition assistance (AA) data is sent through counting of the number of tests (S410).

In case of the second state, the sensitivity assistance (SA) data is sent (S411), and the pilot phase measurement (PPM) search operation and the GPS search operation are performed (step S415).

In case of the third state, the success/failure of the test is informed to the user interface (UI) (S412).

Here, in case of the first state, it is judged whether the setting by the user is no SA (use_sa == no sa) (S413) after sending the AA data, and if not, the timer for receiving the SA data is driven (S414).

If use_sa == no sa, the PPM search operation and the GPS search operation are performed (S415).

Also, in case that the setting by the user is use_sa == with SA, that is, in case that the timer for receiving the SA data is expired and in case that the PPM result from the search block is processed, the step S408 is performed.

Also, in case that the success/failure of the test operation is informed to the user interface in the third state, it is judged whether the number of tests to be performed remains (S416), and if so, the test process is performed again, starting from the step S405.

If the test has been repeatedly performed for the predetermined number of times, the test result is displayed as the measured item values (S417) as shown in FIG. 3, and then the test is terminated (ntest_end_test) (S418).

As described above, the apparatus and method for testing the performance of a mobile station having the GPS function according to the present invention can solve the problems involved in the prior art in that since the diagnostic monitoring device (DM) cannot recognize the test proceeding state of the MSUT, the next process is performed after a proper delay time.

That is, it can solve the problems in that since the diagnostic monitoring device waits for until the delay time even if the internal performance test of the MSUT is completed, the test time is unnecessarily lengthened.

Also, since the IS-801 data message transmitted through the car kit between the diagnostic monitoring device (DM) and the MSUT is stored inside the MSUT, the test

time delay required for the data transmission can be eliminated.

[EFFECT OF THE INVENTION]

As described above, the apparatus and method for testing the performance of the mobile station having the GPS function according to a preferred embodiment of the present invention, in which the test block and the test user interface (UI) are constructed in the MSUT, have the following effects.

First, the time required for the GPS performance test of the mobile station having the GPS function can be reduced by 50% in comparison to the prior art by adopting the Qualcomm MSM chip.

Second, since the frequency of tests becomes greater than that of a competing company due to the reduction of the test time, it is possible to improve the reliability of products.

Third, since the test is performed only through the user's manipulation on a keypad of the MSUT and thus the use of the a personnel computer including the diagnostic monitoring device is not required, the construction of the test equipment is simplified and the test cost can be reduced.

Fourth, since the test can be performed by driving the user interface (UI) of the MSUT through the DM even though the test is performed in a state that the MSUT is put in the shield box for the air test or shielding, the test time is kept to be reduced even if the DM and the MSUT are connected.

It will be apparent to those skilled in the art than various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An apparatus for testing performance of a mobile communication station having a global positioning system function, comprising:

a radio frequency (RF)/intermediate frequency (IF) block for converting GPS (Global Positioning System) RF (radio frequency) signal and the CDMA (Code Division Multiple Access) RF(radio frequency) signal to intermediate frequency/baseband signals;

a keypad/display for inputting a user test command from a user thereon and displaying a test result respectively, a GPS (Global Positioning System) search block for searching GPS; and

a mobile station modem(MSM) equipped with a test software for estimating the test result by performing test program with receiving the test mobile station(MSUT) status information from the GPS search block in accordance with the test command from the user through a user interface and a test mobile station(MSUT) incorporating the MSM.

2. The apparatus of claim 1, wherein test block outputs data acquisition assist (AA) and sensitivity assist (SA) data messages to the GPS search block, the data being transmitted with an IS801 protocol, in accordance with test command by a user.

3. The apparatus of claim 1, wherein the MSUT is located inside the shield box, and a universal asynchronous receiver/transmitter (UART) for transmitting/receiving the data from/to an external diagnostic monitoring device (DM) is adapted in the MSUT.

4. The apparatus of claim 1, wherein, in case of driving the test software by manipulation of the user on the keypad, the driving performance test of the MUST is performed by the constituent elements with the procedures and/or elements of a status information of the MSUT generated from the GPS search block, the test block and a test command from the test block (Test command from test s/w), Data Acquisition Assist (AA) data message and Sensitivity Assist (SA) data message, a test software status information (Test s/w status info), a test user Interface and a test command for user outputted therefrom, a keypad, and a User Interface Input/Output through the key pad.

5. The apparatus of claim 1, wherein, in case of driving the test software by manipulating the test user interface (UI) of the MSUT using the diagnostic monitoring device (DM), the driving is performed by the constituent elements with the procedures and/or elements of a test command from the diagnostic monitoring device (DM), a status information of the MSUT generated from the GPS search block, the test block and a test command from the test block (Test command from test s/w), Data Acquisition Assist (AA) data message and Sensitivity Assist (SA) data message, a test software status information (Test s/w status info), a test user Interface and a test command for user outputted therefrom, a keypad, and a User Interface for test and test command outputted therefrom.

6. The apparatus of claim 1, wherein, in case of driving the test software by transmitting the test command from the diagnostic monitoring device (DM) to the MSUT, the performance test of the MUST is performed with the procedures and/or elements of by the constituent elements of a test command from the diagnostic monitoring device (DM), a status information of the MSUT generated from the GPS

search block, the test block and a test command from the test block (Test command from test s/w), and a Data Acquisition Assist (AA) data message and a Sensitivity Assist (SA) data message.

7. The apparatus of claim 1, wherein, in case of using the display means of the MSUT as the display means of the test result, the display of the test result is displayed with the procedures and/or elements of by the constituent elements of a status information of the MSUT generated from the GPS search block, the test block and a test command from the test block (Test command from test s/w), Data Acquisition Assist (AA) data message and Sensitivity Assist (SA) data message, a test software status information (Test s/w status info), a test user Interface and a test command for user outputted therefrom, a keypad, a User Interface for test and test command outputted therefrom, a keypad, and a User Interface Input/Output through the key pad.

8. The apparatus of claim 1, wherein, in case of using the message display window of the diagnostic monitoring device (DM), the display of the test result is displayed by the constituent elements of a data logging in response to the test result from the diagnostic monitoring device (DM), a status information of the MSUT generated from the GPS search block, the test block and a test command from the test block (Test command from test s/w), and a Data Acquisition Assist (AA) data message and a Sensitivity Assist (SA) data message.

9. A method for testing performance of a mobile communication station having a global positioning system function, comprising:

setting set values according to a test type by an input through a keypad of the

mobile station;

if an idle mode is in an off state, entering a traffic state;

if a currently proceeding test is for the first time, controlling a start of a global positioning system (GPS) operation;

judging whether the present state is the first state that waits for the AA data after passing through the test management step, the second state where the setting by the user is With SA(use_sa = with SA) or the third state that waits for the test result;

sending the acquisition assist (AA) data message and counting a number of tests in the first state or performing a pilot phase measurement (PPM) search operation and a global positioning system (GPS) search operation using the AA data message and the SA data message in the second state;

if in the third stat, informing the success/fail of the test to a User Interface and repeatedly testing each test item of the performance by using the performed result in a predetermined number of the tests; and,

displaying the repeated test results in predetermined items.

10. The method of claim 9, further comprising the steps of:

judging if a test mode is "use_sa == no sa" after the AA data message is sent, if not, and driving a timer for receiving the SA data message; and

if the test mode is "use_sa == no sa", performing the PPM search operation and the GPS search operation.

11. The method of claim 9, further comprising the steps of:

performing again from the test management step in case the user is use_sa == with SA, and in case that the timer for receiving the SA data is expired or the PPM

result from the search block is processed.

12. The method of claim 9, wherein the test item is one of a sensitivity, C/NO and Doppler estimation (CnO/Dopp), and time measurement (Tcal).

13. The method of claim 9, wherein in case of testing the sensitivity, the present mode is changed to a GPS continuous mode to proceed the performance test, a rate of success s is continuously updated (s = m/n * 00) as the number n of proceedings and the number m of successes are simultaneously counted, and the updated rate of success is displayed through an liquid crystal display (LCD) panel of the MSUT.

14. The method of claim 9, wherein the test mode whether to proceed a test with SA is set to test mode designation, designation of whether to proceed the test with SA or without SA, and designation of the number of tests.

15. The method of claim 9, wherein the test user interface for driving the test software on the MSUT is located on a test mode menu list to which an access by a general user is intercepted from a general user.

16. The method of claim 9, wherein the AA and SA data messages are defined by an IS801 protocol.

17. The method of claim 9, wherein the test proceeding is performed by programming the corresponding test process including an internal software test block of the MSUT.

DRAWINGS

FIG. 1

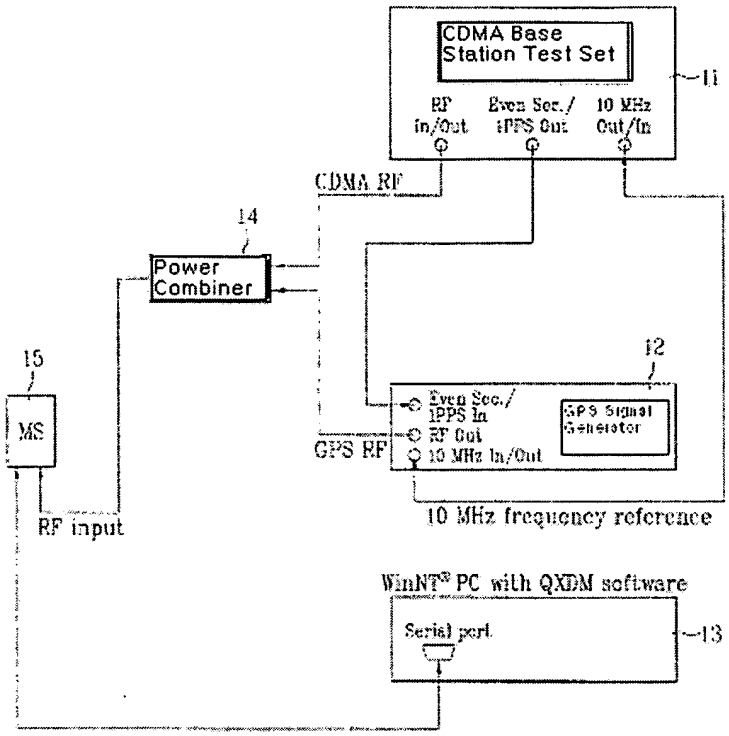


FIG. 2

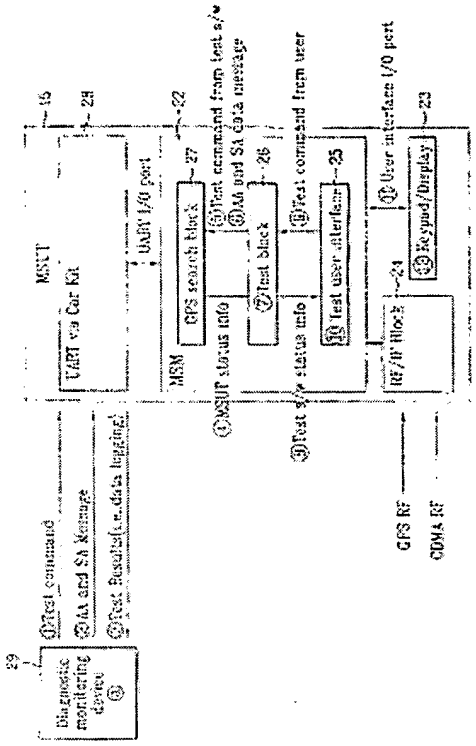

MSM
UART via Car Kit
UART I/O port
GPS search block
Test block
Test user interface
RF/IF Block
Keypad/Display
User interface I/O port
GPS RF
CDMA RF
Diagnostic monitoring device

FIG. 3

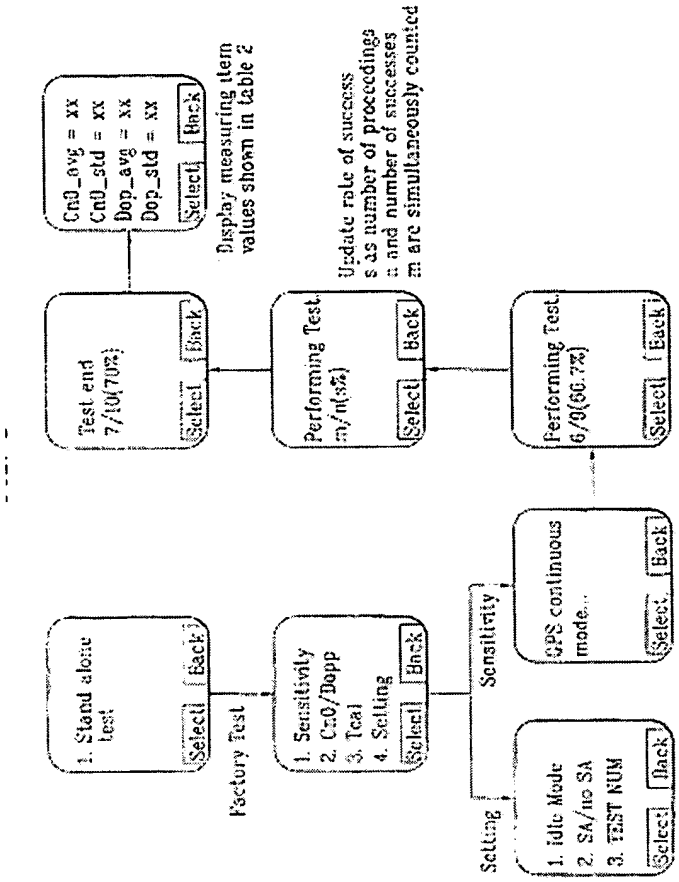

1. Stand alone test
Select
Back
Factory Test
1. Sensitivity
2. C/O/Dopp
3. Tcal
4. Setting
Select
Back
Setting
Sensitivity
1. Idle Mode
2. SA/no SA
3. TEST NUM
Select
Back
GPS continuous mode...
Select
Back
Performing Test.
6/9(66.7%)
Select
Back
Performing Test.
m/n(s%)
Select
Back
Update rate of success
s as number of proceedings
n and number of successes
m are simultaneously counted
Test end
7/10(70%)
Select
Back
Display measuring item values shown in table 2
Cn0_avg = xx
Cn0_std = xx
Dop_avg = xx
Dop_std = xx
Select
Back

FIG. 4

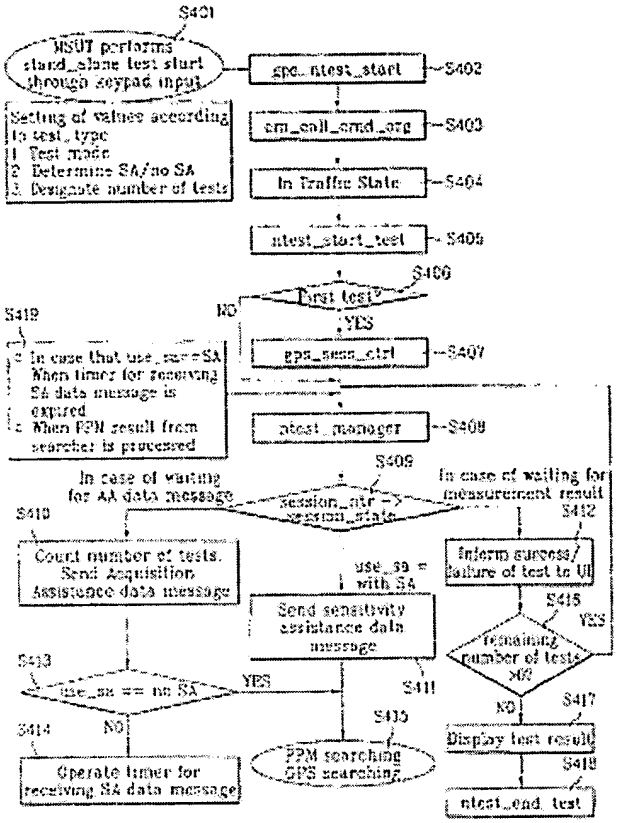
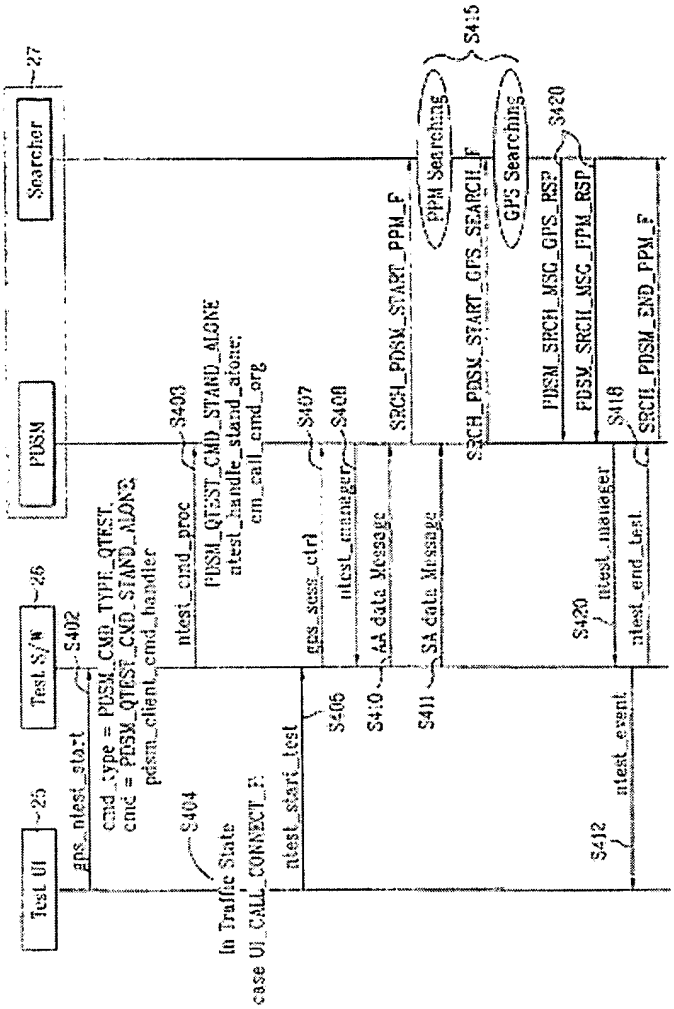

S401
MSUT performs stand_alone test start through keypad input
Setting of values according to test_type
1. Test mode
2. Determine SA/no SA
3. Designate number of tests
epc_ntest_start
S402
sm_call_cmd_org
S403
In Traffic State
S404
ntest_start_test
S405
S406
First test?
NO
YES
S419
In case that use_sa = SA
When timer for receiving SA data message is expired
When PPM result from searcher is processed
epc_sess_ctrl
S407
ntest_manager
S408
S409
In case of waiting for AA data message
session_str -> session_state
In case of waiting for measurement result
S410
Count number of tests. Send Acquisition Assistance data message
use_sa = with SA
Send sensitivity assistance data message
S412
Inform success/ failure of test to UI
S415
YES
remaining number of tests >0?
S413
use_sa == no SA
YES
S411
NO
S417
Display test result
S414
NO
S416
PPM searching GPS searching
S418
ntest_end_test
Operate timer for receiving SA data message

FIG. 5


Test UI
Test S/W
PDSM
Searcher
gps_ntest_start
cmd_type = PDSM_CMD_TYPE_QTEST
cmd = PDSM_QTEST_CMD_STAND_ALONE
pdsm_client_cmd_handler
S402
S403
ntest_cmd_proc
PDSM_QTEST_CMD_STAND_alone
ntest_handle_stand_alone;
cm_call_cmd_org
S404
In Traffic State
case UI_CALL_CONNECT_F:
ntest_start_test
S406
gps_sess_ctrl
S407
ntest_manager
S408
S410
AA data Message
SRCH_PDSM_START_PPM_F
PPM Searching
S415
S411
SA data Message
SRCH_PDSM_START_GPS_SEARCH_F
GPS Searching
PDSM_SRCH_MSG_GPS_RSP
S420
PDSM_SRCH_MSG_FPM_RSP
S420
ntest_manager
S416
ntest_end_test
SRCH_PDSM_END_PPM_F
S412
ntest_event

DECLARATION

I, Sun YOU of 168-32, Seongbuk-gu, Seongbuk 1(il)-dong, Seoul, Republic of Korea declare that I have a through knowledge of the Korean and English language and the writings contained in the following pages are correct translation of the attached Korea Patent Application No. 10-2002-0036001.

This 24th day of March 2005

BY Sun You

Sun YOU